INDIA POINT RAILROAD BRIDGE
Spanning Seekonk River between
Providenge and East Providence
Providence
Providence County
RRode Island

HAER No. RI-54

PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

HISTORICAL AMERICAN ENGINEERING RECORD
National Park Service
Northeast Region
U.S. Custom House
200 Chestnut Street
Philadelphia, PA 19106

HISTORIC AMERICAN ENGINEERING RECORD

INDIA POINT RAILROAD BRIDGE

HAER
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4-PROV,
204-
HAER No. RI-54

Location: Spanning Seekonk River between Providence and East Providence
Providence, Providence County, Rhode Island

USGS Providence, RI Quadrangle
Universal Transverse Mercator Coordinates: 19.302060.4632010 (west end)
19.302180.4632000 (east end)

Engineer/Architect: New York, New Haven & Hartford Railroad

Fabricator: Boston Bridge Works

Date of Construction: 1902–1903

Present Owner: City of Providence

Present Use: Not in use

Significance: The India Point Railroad Bridge is one of 25 surviving swing bridges in southern New England, and one of three in Rhode Island. It is an example of early-twentieth-century bridge truss design in a moveable-span bridge, a type of public works improvement common in the late nineteenth century when rivers were crossed by numerous highway and railroad bridges. It was fabricated by the Boston Bridge Works, the dominant New England bridge building company at the turn of the century, which used an image of this bridge in their advertising as a typical example of their capabilities.

Project Information: The U.S. Army Corps of Engineers proposes to demolish the India Point Railroad Bridge once documentation has been completed and ownership has been transferred from the City of Providence. The proposed project will impact the historic and engineering integrity of this property. In accordance with an agreement between the U.S. Army Corps of Engineers and the Rhode Island State Historic Preservation Office, Historic American Engineering Record documentation is to be prepared for the bridge in order to mitigate the adverse effect of demolition.

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PART I DESCRIPTIVE INFORMATION

The India Point Railroad Bridge is located immediately southeast of downtown Providence, Rhode Island, and spans the mouth of the Seekonk River where it divides Providence from East Providence and empties into Providence Harbor. The bridge consists of four, double-track, riveted, structural steel spans. The center-pivot, swinging draw span, located on the west side of the river, consists of two end-to-end Baltimore through trusses joined by a central tower, resting on a central granite pier. Two fixed, pony-type, Pratt truss approach spans are located on the east side of the river. The swing span is currently maintained in the open position.

The swing span consists of two identical, 109 ft, 10 in, riveted, through-type, Baltimore (Petit)-type (modified Pratt) trusses unified by a continuous, 222 ft, 8 in long floor assembly. The height of the entire assembly from the top of the central superstructure to the bottom of the pivot mechanism is 48 feet. The truss web design modifications consist of vertical sub-struts and diagonal sub-ties, which divide the web arrangement into eight, 1 ft, 8.75 inch panels. The trusses are 29 feet wide between center lines and 35 feet high. All truss members are of riveted, built-up construction. The upper and lower chords, and the inclined end-posts are of box-girder construction, with open lattice-bar on the bottoms of the upper chords and end posts, and at the top and bottom of the bottom chords. The diagonals are built-up, bar-laced members. The sub-struts and sub-ties are of solid, I-beam construction. The panel-point intersections are joined by substantial polygonal gusset plates. Each truss has deep end portal braces and an intermediate transverse brace with triple-intersecting latticework with solid curved gusset plates at the upper corners. The top chords are joined by solid diagonal lateral bracing, linked by a deep, central, longitudinal stiffening brace running the length of each truss. Vertical clearance from top-of-rail to portal brace is 21 ft. A Boston Bridge Works builder's plate is mounted over the north portal, and is supported by a simple surround of curved, decorative brackets. The builders plate displays the legend "BUILT AND ERECTED BY THE BOSTON BRIDGE WORKS—DESIGNED BY THE ENGINEERING DEPARTMENT, N.Y., N.H. & H. R.R. CO.". The continuous, bottom linking chord is 5 ft deep, and of built-up, riveted, I-beam, floor-beam-and-stringer construction with floor beams attached at the panel points, and diagonal bottom lateral bracing. Prominent triangular floor gusset plates extend down from the truss panel points. Four longitudinal stringers are riveted to the floor beams and carry the railroad ties, with each of the four rails mounted directly above each stringer.

The two trusses are linked at the center of the swing span by a 42 ft-tall structure which also supports the bridge operator's control cabin, located above and between the two draw span trusses. Rising from a point at the foot of the two trusses, this structure consists of two vertical, built-up posts with lace-bar sides, joined by lace bars on the inside and outside faces to form massive, built-up paired posts on both sides of the bridge, linked by a transverse, lattice-bar brace. A set of four diagonal eye bars link the top of each post assembly with the top chord of each truss. These four joints are the only pinned connections on the bridge. Midway up each post assembly, a solid, built-up platform with curved gussets supports the bridge operator's control cabin. The west support posts carry a cluster of electrical conduits and relay boxes. The operator's cabin is a rectangular, 6- by 4-bay, wood-frame structure with corrugated metal sheathing on its sides and gable roof. The structure is lit by banks of closely-spaced windows with one-over-one sash which provide a clear view of the rail and water approaches to the bridge. The entrance is in the northeast corner, and is reached by a plank tread stairway with pipe railing affixed to the east elevation of the bridge. The cabin contains electrical relay equipment cases at its west end, and a bank of tall metal levers for manual operation of the bridge mechanisms on a raised wood platform at its east end. The original tongue-in-groove wall and ceiling paneling is in place.

The central swinging span pivot rests on its original, 36 ft, 4 in, cylindrical granite block drum pier, providing an 80 ft-wide ship channel on either side of the pier in the open position. The top course of stones are bound by an iron band with a tensioning turnbuckle. A set of electrical bridge pivot drive motors and associated gear mechanisms are located either side of the center pivot within the bridge superstructure, between the inner floor stringers and beneath the railroad ties. A vertical shaft with a toothed gear extends from each drive assembly and engages a toothed ring gear that runs around the perimeter of the central pier. The center pivot area under the bridge was originally protected by a plank enclosure, now deteriorated. A large, T-shaped manual bridge turning wrench is attached to the north drive motor assembly and rises from the wood tie decking under the bridge operator's cabin. Mechanical devices are located at the swing span ends and on the central pier to carry the live load and to lock and level the bridge and align tracks when in the closed position. These mechanisms are driven by the electrical motors and linked to the manual levers from the operator's control cabin by a system of rods and bell cranks running along the railroad tie deck. The swing span pivots on a central, lenticular, phosphor-bronze bearing housed under the center of the span. Eight stabilizing wheels are mounted under the center of the swing span, and ride on a circular steel track which runs around the perimeter of the pier. These wheels compensated for load imbalances when the bridge was in the open position and in motion.

The west swing span abutment is original and built of regularly-coursed, quarry-faced granite blocks with a prominent top course. Two webbed, cast-iron bridge leveling blocks are located on the west abutment. A rough granite block retaining wall extends along the bank on either side of the abutment. A timber fender structure mounted on wood posts is located around the perimeter of the bridge. This structure is in good repair on the east channel. The west channel side is in deteriorated condition, with fender boards missing and loose, rotten, or missing posts.

The fixed eastern approach superstructure consists of two riveted, pony-type Pratt trusses over the river. The eastern, landward truss is 73 ft, 3 in long, and consists of six, 12 ft, 2½ in panels; the riverward truss is 98 ft, 8 in long and consists of eight, 12 ft, 4 in panels. The trusses are 29 feet wide between center lines, and 17 feet high. The truss members are all of riveted, built-up construction. The upper and lower chords, and the inclined end-posts are of box-girder construction, with open lattice on the bottom of the upper chord and end posts, and at the top and bottom of the bottom chord. Diagonals are built-up I-beams with open lattice web, and the vertical are solid-web I-beams. All intersections are joined by substantial polygonal gusset plates, and the verticals are stiffened on the track side by a solid web bracket between them and the floor beam. The bottom chord is 5 ft deep, and of built-up, riveted, I-beam, floor beam-and-stringer construction with floor beams attached at the panel points, and diagonal bottom lateral bracing. Four longitudinal stringers are riveted to the floor beams and carried the railroad ties, with each of the four rails originally mounted directly above each stringer. All four corners of each span rest on cast, webbed pillow blocks. The river piers are round, cast reinforced concrete replacements for the original granite block structures. The eastern abutment is original and built of regularly-coursed, quarry-faced granite block with prominent top courses. A rough granite block retaining wall extends along the bank on either side of the abutment. A deteriorated timber fender pier supported on wood piles extends upstream from the northwest corner bridge pier.

PART II HISTORICAL INFORMATION

The India Point Railroad Bridge was also referred to as Bridge 0.95 by the New Haven Railroad, as it was located .95 miles east of the Fox Point piers, the western terminus of the New Haven's 8.09-mile Fox Point—Valley Falls Branch line. This branch line was an end-to-end combination of two segments of two

historically significant rail lines. The section of track which originally began at the east end of the bridge and then turned north to a point just north of the former Waterman Street Bridge, or "Red Bridge" as it was also known, is a short segment of the original Boston & Providence Railroad (B & P). Chartered in 1831, the B & P was one of the first three railroads in New England. When completed in 1834, it reached Providence via an alignment that proceeded south from Attleborough, Massachusetts to India Point at East Providence, where the tracks ended and passengers accessed Providence on foot or by horse-drawn carriage over a 1794 timber bridge. In 1835 this service was replaced by new wood railroad trestle across the river into Providence (Ericson 1997).

In 1847 the Boston & Providence built a new alignment from East Switch in Attleborough, arranged trackage rights over the Providence & Worcester Railroad at Pawtucket, Rhode Island, and established a direct Providence connection with the New York, Providence & Boston Railroad. This latter road was one of several lines being built along the shore of Long Island Sound which were eventually absorbed by the New York, New Haven & Hartford Railroad, now part of Amtrak's Northeast Corridor route. The construction of the new B & P alignment into Providence relegated the original B & P main line to India Point and over the Seekonk River to Fox Point to freight branch line status. A heavier, iron draw bridge was built at India Point for this line in 1867–1868. In 1874, the Providence & Worcester Railroad entered an agreement with the New Jersey Central Railroad and the Pennsylvania Coal Company to construct an intermodal ship-to-rail coal facility, the Wilkes Barre pier, at India Point. The P & W proceeded to build the East Providence Branch south from Valley Falls, briefly through Massachusetts for a third of a mile at Attleborough, back into Rhode Island at Pawtucket, south to the junction with the former B & P main line at East Providence, over the B & P to the India Point bridge, and south to the Wilkes Barre pier. This line and the track across the Seekonk River became part of the New York, New Haven & Hartford in 1892, and the Penn Central in 1969. It reverted to private ownership as part of the rejuvenated Providence & Worcester Railroad in 1973, and sections of the line continue to be used for freight rail traffic (Karr 1995:139–152). The India Point Railroad Bridge, however, remained in the ownership of the Boston & Providence, an organizational name which was retained for the real estate company leased by the New Haven Railroad (Bliek 1997).

The India Point Railroad Bridge was built over the Seekonk River, which is navigable from the river's mouth at the northeast end of Providence Harbor, upstream to Pawtucket, RI. The bridge was sited at the Seekonk River narrows, a tight channel with an eastward reverse bend, located at the mouth of the harbor between downtown Providence and East Providence. Historically, these narrows have been the site of numerous railroad and highway crossings. The India Point Railroad bridge is one of four railroad crossings at this site, the first being the 1835 Boston & Providence Railroad trestle, the second an 1855 improved timber trestle, the third the 1867–1868 iron Pratt truss swing bridge, and the fourth the existing 1902–1903 bridge. In addition to this crossing, a series of highway bridges had been located approximately 250 ft upstream since 1793, culminating with the existing Washington Bridge. Later in the nineteenth century, this arrangement of bridges became increasingly hazardous to marine navigation. The narrows were subject to rapid tidal flow, often exceeding five miles per hour. The installation of numerous bridge piers, fenders, and causeways created a tidal bottleneck, increasing tidal flow speeds and delaying the tides at the Pawtucket docks. The draw span on the 1867–1868 bridge, a squat, triangular, iron, Pratt truss, was located on the east, outboard side of the river bend, as was the draw in the Washington Bridge. This configuration was hazardous for ships negotiating the curve during fast tides. Attempts to guide ships by the installation of wooden fenders and channel pilings effectively reduced the 60 foot wide 1867–1868 India Point draw span to 47 feet (Chief of Engineers 1874:227–234).

The history of the India Point Railroad Bridge was closely related to navigational interests, and its eventual construction ended years of conflict over access to the wharves of Pawtucket and East Providence. In 1874 the City of Providence was considering rebuilding the Washington Bridge. At that time, the U.S. Army Engineers had authority, albeit limited, over navigable waterways. In his report to the U.S. Army Chief of Engineers of that year, Brevet Major General G.K. Warren, referring to the situation at the Seekonk River, called for "legislative action or other control by the General Government, in order to remedy the injury caused to navigation by bad bridges." Warren stated that "The present railroad bridge [1867–1868] might have been, and should have been, better located", and that steps be taken to "control the bridging of the Seekonk River in the interest of navigation" (Chief of Engineers 1874:227–229). More specifically, the report recommended that the new Washington Bridge have two 80 ft spans, located opposite the railroad bridge spans (Chief of Engineers 1874:233)

On May 29, 1884, the Rhode Island legislature voted to create a committee to study the issue of the India Point bridge. The new Washington Bridge was under construction in 1888, with its draw openings located at its western end, at the opposite side of the river from the India Point bridge, potentially creating an even more hazardous ship channel. In his report to the U.S. Army Engineers of the same year, Brigadier John Newton stated that "Neither the location nor the plans of these bridges received the sanction of Congress...the passage of vessels through the bridges will be tortuous, and when the tide is running, dangerous. It will doubtless be found necessary to remove the draw openings in this [railroad] bridge to the westward, so that they will be opposite or nearly opposite the draw openings in the new [Washington] highway bridge, and to increase the width of the [draw] to 80 feet" (Chief of Engineers 1888:2530). During the 1880s, the length and draft of marine vessel was increasing, creating additional difficulties for shippers on the Pawtucket docks. The Pawtucket Town Council petitioned the Chief of Engineers, complaining that "It is an undisputed fact that the railroad bridge is the only structure upon the river that is an obstruction...the draw should be placed further west, and have two openings of not less than 80 ft each..." (Chief of Engineers 1888:2531).

With passage of the River and Harbor Act of 1888, the engineering of navigable waterways fell under control of the U.S. Army Engineers. The act and the Pawtucket petitions prompted a through assessment of the situation on the Seekonk River. In 1900, Major D.W. Lockwood, in his Report to the U.S. Army Engineers, concluded that "the real trouble, in my opinion, is the railroad bridge." By this time, the draw spans of both the upstream Washington and Red bridges had been moved westward and expanded to twin 80 ft openings, but the 1867–1868 railroad bridge remained as built. The east draw had been completely closed, leaving one 47 foot channel. This state of affairs led U.S. Army Engineers Colonel G.L. Gillespie to declare that "no further appropriation be made for the improvement of the river from the railroad bridge to the town of Pawtucket until the bridge is reconstructed to meet the demands of commerce of the upper reach of the river." (Chief of Engineers 1900:1306–1307).

Due to mounting pressure from the War Department, the merchants of Pawtucket, and the State Legislature, the New Haven's response to this situation was rapid. On May 31, 1900, the Rhode Island General Assembly passed an act directing the New York, New Haven, & Hartford Railroad to construct a new railroad bridge over the Seekonk River at India Point. The act specified that the new bridge be double-tracked, and "contain a good draw, not less than eighty feet wide...and as near as convenience will permit in line with the draw in the Washington Bridge." Plans for the bridge were drawn, and approved by the State Board of Harbor Commissioners and the United States War Department (Report Of Commissioners 1900:11). Contracts were awarded late in 1901, with the substructure work awarded to Holbrook, Cabot & Rollins of Boston, MA, and the steel bridge superstructure awarded to the Boston Bridge Works. Substructure work commenced on

December 20, 1902, and the superstructure was started about September 15. Work was completed about June 1, 1903 (Report of Commissioners 1903:12). As specified, the new swinging draw span provided two 80-ft channels, and was located west of the earlier draw span, and in line with the Washington Bridge draw. Work was complicated and prolonged due to the requirement that the movement of rail and marine traffic be unimpeded during construction. To facilitate this requirement, the new bridge was built in line with the old, with the single-track 1867–1868 draw span retained during construction and the new double-track draw span built immediately to the west. This arrangement allowed uninterrupted passage of steamships and barges, as well as an average of one rail movement every four minutes during working hours (Report of Commissioners 1902:10–11).

The famous New England Hurricane of 1938, which devastated the region's coastline, also heavily damaged the Fox Point dock district, reducing rail traffic over the bridge after 1940 (Bliek 1997). In 1952 the New Haven approved a $1 million repair program for its 43 largest railroad bridges. This program included repair and replacement of select members, cleaning and repairing bearings of moving bridges, cleaning and repainting of all steelwork, repairs to stonework, and addition of riprap to bridge piers. Although the India Point Railroad Bridge carried reduced traffic, repairs to the bridge were considered "urgent", and were estimated to cost $50,000. The Grosser & Schlager Iron Works of Somerville, Massachusetts were awarded the contract for the New Haven's Boston- and Providence-area bridges (New Haven Railroad 29 July 1952). In 1955, the railroad spent $71,000 to rebuild the timber boat fender racks at the bridge (New Haven Railroad 9 May, 1955). The bridge was officially abandoned for rail traffic in 1974 (Kulick and Bonham 1978:205). Subsequently the Boston & Providence Real Estate Company sold the Fox Point freight yard to the City of Providence, with the agreement that they also take the India Point Railroad Bridge. The Fox Point yard site was tumed into a public park by the City of Providence, and the bridge has remained in the open position for Seekonk River marine traffic since then.

The India Point Railroad Bridge is one of 25 remaining swing bridges in Southern New England, six of which are railroad bridges. It is one of three swinging bridges in Rhode Island, the others being the 1899 Sakonnet River Bridge and the 1927 Point Street Bridge in Providence. It is the only swing bridge remaining in Rhode Island (Connors and Galer 1997:7). This riveted bridge is a particularly massive example of early-twentieth-century steel truss bridge designs, which typically settled on variations of the Pratt and Warren trusses that emerged as the dominant types from a variety of proprietary nineteenth-century iron and steel bridge designs (Condit 1961:82). The two swing spans are modified Baltimore (Petit)-type (modified Pratt) trusses, with the vertical members in compression and the diagonal members in tension. In a standard Baltimore truss, vertical sub-struts extend from the diagonal mid-points to the lower chord; these modified Baltimore trusses have sub-struts and sub-ties, resulting in two full-length diagonals within each panel. The name "Baltimore" refers to the Baltimore & Ohio Railroad, which first introduced these modifications to the Warren-type truss in the 1870s to accommodate the increased weight of railroad locomotives and rolling stock (Connors and Galer 1977:8).

The India Point Railroad Bridge is also an example of a moveable-span bridge, a type common in the late nineteenth century when rivers were crossed by numerous highway and railroad bridges. Moveable-span bridges were designed with extra strength to remain rigid and resist the extra stresses placed upon them through a range of positions, as they rested on their ends when closed, and on a central pivot when open. Moveable bridges also included motorized and manual turning systems designed for movement, locking devices, safety signals, and in some cases, facilities for human operation and temporary accommodation (Connors and Galer 1997:9) The India Point Railroad Bridge is an early example of a center-bearing swing

bridge, a type which emerged at the turn of the century and pivots on a central shaft with a bearing, with several small rollers riding on an outer ring on the perimeter of the pier to equalize imbalances. This type of pivot offered advantages including simplicity of design and construction, less wear and maintenance, ease of repair and turning, better load distribution, and lower cost compared to the older, rim-bearing-type pivot, which used an outer ring of multiple rollers to carry the swing span. By the 1920s the center-pivot bridge had mostly replaced the rim-bearing type (Connors and Galer 1997:10).

The India Point Railroad Bridge was designed by the New York, New Haven and Hartford Railroad, and fabricated by the Boston Bridge Works (BIW). This company was founded in 1876 by David Herbert Andrews, and operated from its Cambridgeport, Massachusetts shops for 62 years. The BIW became the largest bridge building company in New England by the turn of the century (Galer 1989:20). The BIW was successful due to the notable variety of iron and steel fabrication capabilities it offered, including roofs, floors, and fire-proof buildings, as well as heavy bridges such as that at India Point. In 1895 the BIW made a bold decision to build steel-framed "skyscrapers", including the Worthington Building, the second steel-framed building in Boston (Galer 1989:36). The BIW was financially strong enough to resist Andrew Camegie's 1901 consolidation of 24 U.S. bridge companies into the American Bridge Company, which brought 50 per cent of U.S. bridge-building capacity under the United States Steel Corporation (Galer 1989:50). The BIW was notable for its regional dominance in bridge building and the independence that accompanied this position, however, it was in many respects typical of regional U.S. bridge building companies of the era, and concentrated on standard bridge designs. Perhaps to highlight this position, between 1904 and 1930 the BIW used an image of the India Point Railroad Bridge in their Boston City Directory advertisement as a typical example of their capabilities. The BIW considered the India Point Railroad Bridge as an advertising symbol of their stability and permanence (Galer 1989:51) The BIW suffered a fire in 1932 and although it continued to operate, its capacity was reduced due to the Depression-era decline in construction business. The BIW closed in 1938, having designed and constructed upwards of 50 per cent of the iron and steel railroad and highway structures in New England (Galer 1989:52)

PART III SOURCES OF INFORMATION

A. Plans and Drawings

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USGS Location Map
India Point Railroad Bridge
Providence
Providence County, Rhode Island
Scale: 1:24,000